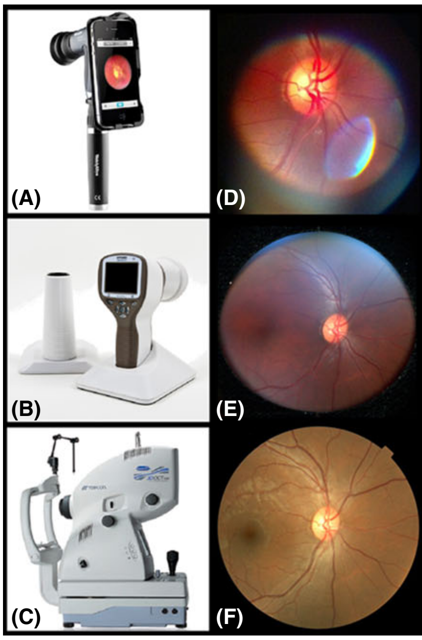

Field of view	25 degrees
Weight	500 grams
Price (euro)	1.400
Image size	1920x1440
Components	WelchAllyn Panoptic 11820
	Apple iPhone 4
	iExaminer

	Mydriasis (n = 27)	No mydriasis (n = 27)
Quality *	2 (2-2)	2 (2-2)
Visibility vessels *	2 (2-2)	2 (2-2)
Visibility disk border *	2 (2-2)	2 (2-2)
Visibility cup-disk ratio *	2 (1-2)	2 (1-2)
Test time (minutes) *	4 (3-5)	5 (4-6)
Attempts *	4 (3-4)	4 (3-4)

Field of view	45 degrees
Weight	400 grams
Price (euro)	7.500
Image size	1936x2592
Components	Optomed Smartscope M5
	Optomed EY3 lens

	Mydriasis (n = 27)	No mydriasis (n = 27)
Quality *	4 (3-4)	3 (3-4)
Visibility vessels *	2 (2-3)	2 (2-3)
Visibility disk border *	2 (2-3)	3 (2-3)
Visibility cup-disk ratio *	2 (2-3)	2 (1-2)
Test time (minutes) *	2 (2-2)	3 (2-3)
Attempts *	4 (3-4)	4 (3-4)

Field of view	45 degrees
Weight	36 kilograms
Price (euro)	15.000 - 20.000
Image size	2048x1536
Components	Topcon 3D OCT-1000

	Mydriasis (n = 27)	No mydriasis (n = 27)
Quality *	4 (4-5)	4 (4-5)
Visibility vessels *	3 (3-3)	3 (3-3)
Visibility disk border *	3 (2-3)	3 (3-3)
Visibility cup-disk ratio *	3 (2-3)	3 (2-3)
Test time (minutes) *	1 (1-2)	2 (1-2)
Attempts *	2 (2-3)	3 (2-3)

Fig. 1. (A) Smartphone-assisted fundus photography set-up; (B) Hand-held fundus photography device; (C) Standard fundus photography device; (D, E, F) Fundus photographs of the same eye taken with devices A, B and C, respectively. The tables in the figure show the device specifications and the scoring summary for each device. *Values are in median (interquartile range – IQR). Images A, B and C originate from online available product images at http://www.welchallyn.com, http://www.optomed.fi and http://www.topcon-medical.eu/.

lower image resolution and it took longer to make fundus photographs with this smartphone set-up. Others show that smartphones can be used for more types of ophthalmologic imaging (Suto et al. 2014), though good image quality is still a prerequisite.

The tested smartphone set-up, does not yet deliver fundus photographs of very high quality. However, point-of-care diagnostics is becoming more important, and smartphone technology is developing rapidly. It is conceivable that smartphone technology combined with ophthalmic equipment can make clinically useful high quality smartphone images of the retina in the near future possible. Our results show that standard fundus photography currently remains first choice, to make retinal images of the highest quality.

References

Bastawrous A, Cheeseman RC & Kumar A (2012): iPhones for eye surgeons. Eye (Lond) **26**: 343–354.

Bernardes R, Serranho P & Lobo C (2011): Digital ocular fundus imaging: a review. Ophthalmologica **226**: 161–181.

Lamirel C, Bruce BB, Wright DW, Delaney KP, Newman NJ & Biousse V (2012): Quality of nonmydriatic digital fundus photography obtained by nurse practitioners in the emergency department: the FOTO-ED study. Ophthalmology **119**: 617–624.

Ozdalga E, Ozdalga A & Ahuja N (2012): The smartphone in medicine: a review of current and potential use among physicians and students. J Med Internet Res **14**: e128.

Suto S, Hiraoka T & Oshika T (2014): Fluorescein fundus angiography with smartphone. Retina **34**: 203–205.

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The air temperature may affect ophthalmologic emergency attendances

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Editor,

There is a commonly held belief that ophthalmologic emergency attendances are affected by the weather. General emergency admissions involving potentially life-threatening states have been reported to correlate significantly with the weather conditions (Macgregor 2003). There have been only two previous publications [from Australia (Young et al. 2012) and France (Bourcier et al. 2003)] that have reported on the influence of weather conditions on attendances at ophthalmologic emergency units, but no published Central European data are to be found. We set out to evaluate possible relationships between climate in the south-eastern Hungarian city of Szeged and attendances at our tertiary ophthalmologic care unit.

The daily numbers of ophthalmologic emergency attendances at weekends and on public holidays during a 3-year period (334 days) were analysed retrospectively. The unit is responsible for the primary emergency care of around 550 000 inhabitants and the tertiary care of 1.35 million inhabitants. Diagnoses were coded prospectively at the time of examination by the duty ophthalmologist or by the ophthalmology specialist trainee under the supervision of a specialist in certain cases. The diagnoses were grouped as

Table 1. Descriptive statistics [mean ± 1 SD; (minimum−maximum)] and correlations of daily attendances and weather variables. Only significant correlations are presented.

	Descriptive values	n_{total}/day	n_1/day	n_2/day	n_3/day	n_4/day
		18.55 ± 5.37 (5–35)	0.87 ± 1.03 (0–8)	1.69 ± 1.53 (0–11)	5.98 ± 2.76 (0–14)	10.01 ± 3.75 (1–21)
T_{max} (°C)	17.24 ± 10.93 (−10 to 38)	Coefficient = 0.21, r = 0.41, p < 0.001			Coefficient = 0.06, r = 0.25, p < 0.001	Coefficient = 0.13, r = 0.37, p < 0.001
T_{min} (°C)	5.81 ± 8.11 (−21.7 to 21.5)	Coefficient = 0.23, r = 0.35, p < 0.001			Coefficient = 0.07, r = 0.21, p < 0.001	Coefficient = 0.14, r = 0.13, p < 0.001
Maximum wind speed (km/h)	16.64 ± 6.79 (4.1 to 39.2)					
Maximum flaw (km/h)	6.39 ± 14.79 (0 to 62.8)					
Precipitation (mm)	1.47 ± 3.83 (0 to 26.4)					
Depth of snow (cm)	1.0 ± 3.9 (0 to 28.2)	Coefficient = 0.37, r = 0.26, p < 0.001			Coefficient = 0.15, r = 0.21, p = 0.002	Coefficient = 0.16, r = 0.17, p = 0.002
Daily sunshine (hours/month)	172.47 ± 36.61 (99 to 255)			Coefficient = 0.09, r = 0.5 p = 0.04	Coefficient = 0.28, r = 0.8, p = 0.002	Coefficient = 0.58, r = 0.93, p < 0.001

T_{max} = maximum daily temperature, T_{min} = minimum daily temperature.

follows: (1) severe trauma that required immediate surgery (n = 289), (2) medical emergencies, in which a delay in care might potentially result in permanent complication (n = 563), (3) mild traumas, for example non-penetrating foreign body or corneal erosion (n = 1998) and (4) medical non-emergencies, for example non-severe conjunctivitis or permanent complaints (n = 3344).

Data relating to weather conditions were obtained from the databases of the Hungarian Central Statistical Office and the meteorological website www.freemeteo.hu. Examined variables were the minimum and maximum daily temperatures (°C), maximal wind speed and maximum flaw speeds (km/h), the level of precipitation (mm), the depth of the snow blanket (cm) and (on monthly basis) the number of hours of sunshine daily.

The data on a total of 6194 patients were analysed. Descriptive values of weather variables and significant correlations are shown in Table 1.

As concerns seasonal difference, significantly fewer people (74% of the summer maximum) attended the emergency room in the winter than in the other seasons (n_{winter} = 1245*, n_{spring} = 1775, n_{summer} = 1674, n_{autumn} = 1515, p < 0.001) (Fig. 1). The daily numbers of mild and non-severe cases (n_3 and n_4) related positively to the daily minimum and maximum temperatures, and related negatively to the depth of snow. The number of hours of sunshine monthly also influenced the number of attendances.

On retrograde stepwise regression, only the daily maximum temperatures proved to be predictive of the peak of the total attendances and the group 4 attendances (R = 0.29 and R = 0.24, p < 0.001), while the wind speed for group 2 attendances (R = 0.16, p = 0.03), and the minimum temperature was predictive for group 3 attendances (R = 0.11, p = 0.041). The number of hours of sunshine was not included in the model.

The effects of wind and precipitation were negligible, in contrast to previous findings (Bourcier et al. 2003; Young et al. 2012). As the weather affected predominantly the number of cases where care would have began 1–2 days later in the absence of severe complications, the comfort of the patient may explain the timing of the attendance, as the patients may have preferred not to wait for the scheduled date and not to have to attend to unit during working hours. Some patients may also have become frightened by symptoms of banal disorders such as subconjunctival bleeding or the severe discomfort of conjunctivitis and seek sudden medical help. The incidence of severe ophthalmologic cases was not affected by the weather conditions. There are relations between the biometeorological factors and some morbidities, for example

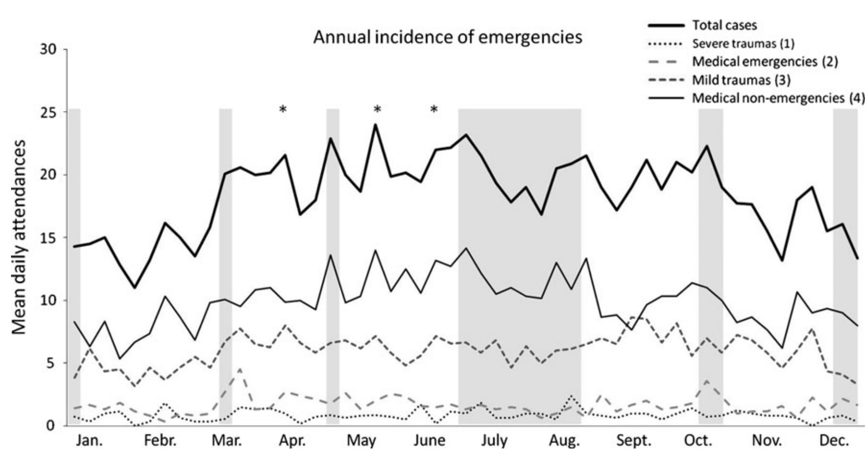

Fig. 1. Annual incidence of emergency attendances. Mean daily numbers of cases are related to holiday seasons (grey fields). Moving religious holidays are denoted by *. Severe traumas and medical emergencies were not affected by seasonality.

stroke (Milojević et al. 2011), panic anxiety (Bulbena et al. 2005) or acute coronary syndromes (Panagiotakos et al. 2004). A direct correlation between the temperature and unnecessary non-emergency ophthalmologic attendances is questionable, as the enhanced frequency of outdoor activity in the spring and summer may be accompanied by an increased possibility of light injuries, and even some pathogens or allergens then occur more commonly.

Independently from the reason, in harmony with previous studies (Diehl et al. 1981), our results might also lead to improvement in staffing arrangements.

References

Bourcier T, Viboud C, Cohen JC et al. (2003): Effects of air pollution and climatic conditions on the frequency of ophthalmological emergency examinations. Br J Ophthalmol **87**: 809–811.

Bulbena A, Pailhez G, Aceña R, Cunillera J, Rius A, Garcia-Ribera C, Gutiérrez J & Rojo C (2005): Panic anxiety, under the weather? Int J Biometeorol **49**: 238–243.

Diehl AK, Morris MD & Mannis SA (1981): Use of calendar and weather data to predict walk-in attendance. South Med J **74**: 709–712.

Macgregor DM (2003): Effect of weather on attendance with injury at a paediatric emergency department. Emerg Med J **20**: 204–205.

Milojević D, Gajić V, Smailagić J, Djonović N, Toncev G & Gajić S (2011): Biometeorological phases influence on stroke morbidity. Med Glas (Zenica) **8**: 229–236.

Panagiotakos DB, Chrysohoou C, Pitsavos C et al. (2004): Climatological variations in daily hospital admissions for acute coronary syndromes. Int J Cardiol **94**: 229–233.

Young TK, Ruddle JB, Crock C & Hewitt AW (2012): Influence of weather conditions on ophthalmic emergency presentations. Clin Exp Ophthalmol **40**: 322–323.

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Relationship between preferred sleeping position and unilateral disc haemorrhage in normal-tension glaucoma patients

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Editor,

Previously, we posited that the lateral decubitus position (LDP) habitually preferred by glaucoma patients might be associated with asymmetric visual field (VF) damage (Kim et al. 2014). And, in an earlier study, we found that the intra-ocular pressure (IOP) of the worse eye in the dependent LDP, based on the mean deviation value of a Humphrey visual field test, was higher than that of the better eye (19.1 ± 3.0 mmHg versus 17.6 ± 2.3 mmHg, $p < 0.001$) (Kim et al. 2013a,b). We hypothesized that progression in glaucoma patients, despite a well-controlled IOP during daylight hours, is associated with the preferred lying position during sleep. In the light of the established association between disc haemorrhage (DH) and VF progression in normal-tension glaucoma (NTG) (Ishida et al. 2000; Drance et al. 2001), we undertook to investigate the relationship of the preferred sleeping position with unilateral DH in NTG.

This retrospective observational case series was approved by the Institutional Review Board of Seoul National University Hospital and was conducted in accordance with all of the relevant Declaration of Helsinki specifications. A total of 119 bilateral NTG patients with unilateral DH, representing 23.3% of 510 treated bilateral NTG cases initially reviewed, were consecutively enrolled from the Glaucoma Clinic of Seoul National University Hospital between September and December, 2012. Unilateral DH was defined as the presence, on electronic medical records and follow-up digital optic disc photographs, of one or more DH in just one eye. DH was defined as an isolated haemorrhage within or on the margin of the optic disc or in the parapapillary retina extending to the disc rim. Alternative causes of haemorrhage were excluded by diagnostic testing for ischaemic optic neuropathy, papillitis, central retinal vein occlusion, diabetic retinopathy and posterior vitreous detachment. Regular follow-ups were conducted at intervals of 1–3 months after the initial detection of DH, and digital optic disc photographs were obtained at intervals of 3–6 months.

A questionnaire on the preferred sleeping position, described in Table 1, was administered to each of the patients, and their answers were recorded by a single observer masked to the ophthalmic examination results. The patients' demographics and questionnaire results were analysed using the paired *t*-test and the one-sample Chi-square test, respectively, according to a significance level of 0.05.

Table 1 summarizes the demographic and survey results on the preferred sleeping position of the 119 NTG patients with unilateral DH. There was no significant difference between the two eyes in any parameter, including baseline IOP. A total of 45 (37.8%) preferred the LDP, 25 (55.6%) of whom preferred the eye with the DH-dependent LDP ($p = 0.456$). The number of digital optic disc photographs ranged from 4 to 14 (mean: 5.4).

The Early Manifest Glaucoma Trial did not find any beneficial effect of IOP-lowering treatment on DH frequency over time, even though it proved efficacious in preventing or delaying progressive VF loss (Bengtsson et al. 2008). In our study, the preferred sleeping position was not associated with the presence of unilateral DH in patients with NTG. Although various mechanisms have been proposed to explain the cause of DH in glaucoma, the precise aetiology remains unknown. We speculate that there might be factors, not associated with positional IOP change (Kim et al. 2013a,b), that impact on glaucomatous progression in eyes with DH.

One limitation of our study is the basing of the preferred sleeping position